

Classification of **Triangulum**® Species

Subject: Life science, classification

Grade: 6-8

Lesson Topic: Classifying Attributes

Length:

Learner Objective:

Students will become familiar with the XID Expert Identification System

Introduction:

You have been exploring the Badlands Wilderness Study Area in early spring and have found a **vernal pool**. Curious as to what life forms might be living in the water, you use a fine mesh screen and draw it through the water to collect whatever microscopic organisms might be there, and rinse the screen into a collection vial. After returning to the lab, you place the water sample in a petri dish, and under the dissecting scope's low power objective lens you are surprised to see a number of different organisms swimming in the water. Although you suspect that they are similar to various **Triangulum**¹ species found in high elevation vernal pools, a review of the existing literature does not provide any information about species found in the ephemeral, snowmelt pools of the Badlands. Perhaps there are some new species. Your task is to create a database that groups the various organisms in your database according to their field data. This will allow you to create the **taxonomy** for the members of the group.

Content:

The XID authoring system allows students to create their own system for the identification of any group of species or objects. Similar to the file trees that manage computer files (ex. Windows Explorer®), students create their own multi-layered menus of *attributes* that can be described and identified.

A dichotomous key, which contains rigid steps and requires the user to have an in-depth knowledge of physical characteristics at all levels, limits our ability to think of plants and animals as anything more than scientific binomial names. The XID System allows students to determine the initial physical attributes by which they will classify the species under study. Additionally, one of the most powerful features of the system allows students to consider attributes that normally would be outside the boundaries of dichotomous keys. Attributes such as location (GIS mapping), plant zones, soil types, aspect, associations with other living things, or *any relevant environmental factors*, can be used as part of the student's classification system.

The XID System feature that allows students to use relevant environmental factors, and associations with species that share the same environment, is especially important in helping them search for a deeper understanding of the complexity of their

world. This deeper understanding comes from knowledge of the interconnectedness of all living things.

In this lesson the students will use the imaginary **Triangulum**® species found in vernal pools (bodies of water remaining from winter snowmelt that persist long enough for a small ecosystem of plants and animals to exist until the pond dries) to create their own XID database. Instead of creating a conventional dichotomous key, students will use all data concerning **Triangulum**® and its environment to create their own key to the species.

Materials and Supplies:

- XID Expert Classification System software (see Resources)
- Student Handout

Anticipatory Set:

Initiate a discussion with students concerning the dichotomous keys created in previous classification lessons by asking how much they can discern about the species natural ecosystem, life habits such as feeding, defense or breeding, and the environmental conditions most favorable to the species. Without making inferences, and discounting prior knowledge of the species, student may not find the keys very helpful in pinpointing aspects about the species life and environment. Emphasize that the XID Classification System allows them to create their own keys with a full range of information about the species they wish to study.

Activity Outline:

The students do the first portion of the activity sheet below in the classroom, either individually or in groups of scientific teams.

The second portion requires a computer lab and the XID software. The teacher, as administrator, will need to enter students' names into the database and provide them with login names. The administrator function of the software enables the teacher to assess the movements and decisions of each student as they build their database.

Closure and Assessment:

Refer the students back to the anticipatory set discussion and have the students compare the amount of information they included in their database to the information that would be available in a conventional dichotomous key.

Evaluation of student worksheets and evaluation of the XID Teacher Administration reports will provide the basis for assessment.

Independent Practice and Related Activities:

Students who are particularly adept with the XID System may wish to create their own database... the XID System is flexible enough to be used for any subject from plants and animals to all the characters in all the Star Wars movies to all the dead insects found in the windowsills throughout the school!

Resources:

XID Expert Identification System was created by, and is available from:

Dr. Richard Old
XID Services, Inc.
Pullman, Washington 99163



<http://www.xidservices.com/>

Vocabulary:

Attributes, Taxonomy, Vernal

National Science Education Standards:

Life Science - CONTENT STANDARD C:

As a result of their activities in grades 5-8, all students should develop understanding of

- ☐ Structure and function in living systems
- ☐ Reproduction and heredity
- ☐ Regulation and behavior
- ☐ Populations and ecosystems
- ☐ Diversity and adaptations of organisms

Science and Technology - CONTENT STANDARD E:

As a result of activities in grades 5-8, all students should develop

- ☐ Abilities of technological design
- ☐ Understandings about science and technology

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The original use of triangulum can be found in a lesson plan titled "Dichotomous Key" located at

<http://pals.sri.com/tasks/5-8/DichotomousKey/rubric.html> or PALS (<http://pals.sri.com>)

PALS (Performance Assessment Links in Science) is an on-line, standards-based, continually updated resource bank of science performance assessment tasks indexed via the National Science Education Standards (NSES), provided by ©1997-2002 SRI International, Center for Technology in Learning. All rights reserved.

² The [XID Expert Identification System](#) was generously provided by Dr. Richard Old of [XID Services, Inc.](#) Information regarding purchase of the system is located in the **Technology** section under **Resources**

Classification of **Triangulum**® Species

NAME _____

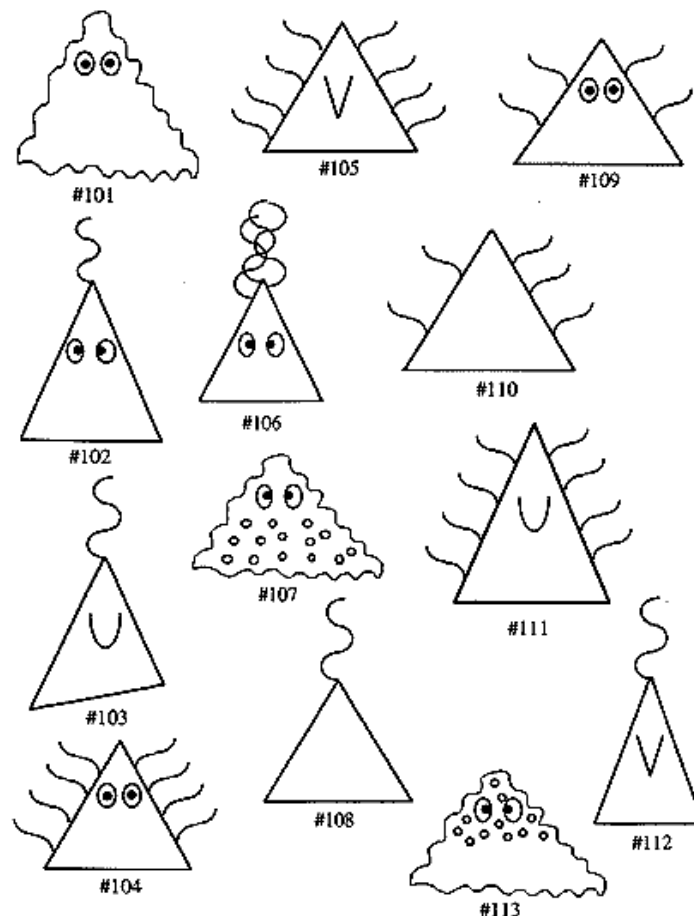
DATE _____

You have been exploring the Badlands Wilderness Study Area in early spring and have found a **vernal pool**. Curious as to what life forms might be living in the water, you use a fine mesh screen and draw it through the water to collect whatever microscopic organisms might be there, and rinse the screen into a collection vial. After returning to the lab, you place the water sample in a petri dish, and under the dissecting scope's low power objective lens you are surprised to see a number of different organisms swimming in the water. Although you suspect that they are similar to various **Triangulum**¹ species found in high elevation vernal pools, a review of the existing literature does not provide any information about species found in the ephemeral, snowmelt pools of the Badlands. Perhaps there are some new species. Your task is to create a database that groups the various organisms in your database according to their field data. This will allow you to create the **taxonomy** for the members of the group.

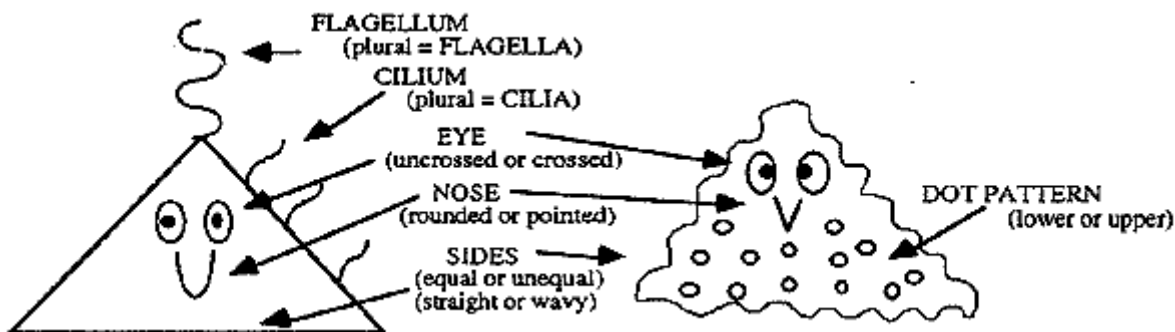
Define **vernal pool**: _____

Define **taxonomy**: _____

After hours in the lab you have created the following sketches of the microscopic organisms found in the vernal pool water samples from the Badlands:



From further research into the existing literature on known species of *Triangulum*, you construct the following drawings with regards to the taxonomy:



From your field notes and observations in the laboratory, you have recorded the following data:

Species ID #	Free Swimming	Bottom Dweller	Pool Size (M ²)	Temp (C)	Responds to Photo stimulus (neg. or pos.)	Color	Substrate Of Pool
101	N	Y	<1	15	N	CLEAR	BASALT
102	Y	N	1-10	10+	N	TAN	BASALT
103	Y	Y	<1	10+	N	CLEAR	BASALT
104	Y	N	>10	1-5	N	CLEAR	BASALT
105	Y	N	>10	1-5	N	CLEAR	BASALT
106	N	Y	1-10	5-10	N	TAN	SILICA
107	N	Y	1-10	15	P	TAN	SILICA
108	Y	Y	<1	10+	N	CLEAR	BASALT
109	Y	N	1-10	10+	N	CLEAR	SILICA
110	Y	N	>10	1-5	N	CLEAR	BASALT
111	Y	N	>10	1-5	N	CLEAR	BASALT
112	Y	N	<1	10+	N	CLEAR	BASALT
113	N	Y	>10	1-5	P	TAN	SILICA

Because the scientific community still utilizes a standard biological classification system that relies on **binomial nomenclature**, you create the following names for the species you have found:

Species ID #	Genus species (<i>proposed Spring 2003</i>)
101	T. waveum
102	T. monoflagelleum
103	T. rotundoflagelleum
104	T. polyciliatum
105	T. pointiatum
106	T. polyflagelleum
107	T. ventridotteum
108	T. equalium
109	T. biciliatum
110	T. oddcilitum
111	T. rotundum
112	T. pointiflagelleum
113	T. dorsolidotteus

Define **binomial nomenclature**: _____

The literature contains no information about the classification of *Triangulum* species, and it becomes necessary to create a new database that describes the characteristics, behaviors, and ecological niche of the species you have found. Rather than trying to construct a standard **dichotomous key**, you decide to use the new **XID Expert Identification System**² developed by Dr. Richard Old of **XIS Service, Inc.** With this system you can create a database for your *Triangulum* species that allows you to organize the valuable field data you've collected and create taxonomy for the species.

Define **dichotomous key**: _____

Creating a New Database

To Login, open the XID program and enter your Login name and Password, *click OK*

My Login name is _____ **My Password is** _____

To create a new database, select **New** from the **File Menu** or press the **New** button on the toolbar. The XID application sets up an empty database and displays the **Database Description Editor**. You must give a title to the new database. If you are building a database of plant or animal species with their scientific names, enable scientific names in this form by checking the box for that option. Pressing the **OK** button creates the top-level menu, with the menu type assigned according to the menu structure type specified in the form.

Name of your new database: _____

The next step is to create a menu structure. The context menu is found with a *right-click* on the Menu structure box. Selecting **Edit** from the context menu for the Menu Structure tree brings up the **Individual Menu Editor** for the top-level menu. Selecting **Add submenu** and **Add menu attribute** from the same context menu allows you to add menus of submenus and attribute menus to the Menu Structure tree. Activating the context menu for an attribute menu and selecting **Insert** from it allows you to insert and define attributes. Continuing this process creates the entire menu structure (*see steps outlined below!*).

Define attribute: _____

Creating your menu structure:

- 1) *right-click* the Menu Structure Box
- 2) *click* Add Submenu. Give it any name you choose (example: movement)
- 3) *right-click* the new Submenu called Movement
- 4) *click* Add Attribute Menu. Give the attribute any name you choose (example: Flagella)
- 5) *right-click* submenu Movement again
- 6) *click* Add Attribute Menu. Give the attribute another movement name (example: Cilia)
- 7) *right-click* the attribute menu title Flagella
- 8) *click* Insert Attribute. Define an attribute (ex. No Flagella)
- 9) *right-click* the attribute menu title Flagella again
- 10) *click* Insert Attribute again. Define another attribute (ex. Single Flagella)

Repeat the steps above to add all the submenus, attribute menus, and specific attributes you feel will adequately describe your collection of Triangulum species and the associated field data. As another example, “Habitat” might be a Submenu, “Pool Size” might be the name of an Attribute Menu, and the range of pool depths would be the various attributes you insert.

If you want to include literature references for the items or species, *right-click* **References** in the tree and select **Insert** from the context menu. Each item or species can be given the desired page number(s), for each reference title. Since these appear to be new species you can skip this for now and enter information later. If it turns out that you have indeed found some new species, *your* published findings would be in the References section!!

Once you have defined menus and some attributes, you can add items or species: *right-click* somewhere within the **Item/Species List** box and select **Insert** from the context menu. This will call the **Item Description Editor**. Enter the Family, Genus, and species names, and a description of the species (you can come back later and fill in the description, general purpose data, comments, and illustrations), then *click* **OK**.

Have you entered all the species names from the chart above? _____ (yes or no)
Your teacher should initial here that this is done _____

Now, here are the steps to see your classification system at work!!!

- 1) *right-click* on any species name you have entered
- 2) *click* **Edit Item Attributes**
- 3) from the list provided, check the boxes that apply to your species
- 4) *click* **NEXT** (if you are editing attributes for many species) or **OK** if you just edit one
- 5) Repeat the process for each species

Items that are eliminated by the XID logic are moved to the end of the Item List. This permits you to edit a subset of the items in the database. This technique can be very useful for entering data for several items at once (via the Mark All and Clear All features in the Item/Species Attribute Data Editor. It can also be used to create a subset database.

Once a database is created, you should save it as an XID Database File by selecting **File | Save**, with the .xid file extension. You can freely edit the database description, menu structure, reference titles and item data.

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